

***Interactive comment on* “Carbonaceous aerosols  
contributed by traffic and solid fuel burning at a  
polluted rural site in Northwestern England” by  
D. Liu et al.**

**Anonymous Referee #1**

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Liu et al., ACPD, 10, 25243–25286, 2010

“Carbonaceous aerosols contributed by traffic and solid fuel burning at a polluted rural site in Northwestern England”

NOTE to editor: The manuscript did not print correctly in PDF; something wrong with PDF code in Figures section.

General comments:

This is a well written manuscript that describes a set of predominately particulate mea-

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surements at Holme Moss site outside of Manchester, England during the winter of 2006. The focus of the paper is on PMF analysis of AMS data, including the classification of Primary Organic Aerosol (POA) into Hydrocarbon-like Organic Aerosol (HOA) likely from traffic and SFOA (Solid Fuel Organic Aerosol) likely from local space heating emissions, refractory black carbon (rBC) analysis from a Single Particle Soot Photometer (SP2) instrument, and optical properties from wavelength dependent absorption measurements. The analyses are not new (having been published before), but the results from this work provides another well characterized data set in support of the interpretation of the POA into two sources in England and connects these source emissions to simultaneously measured refractory black carbon (including emission ratios) and optical properties. The manuscript is suitable for ACP and should be published once the authors address the (minor) comments below.

Specific comments (minor quibbles):

\* The abstract sentence, “The BC incorporation/removal process therefore plays an important role on modulating the radiative properties of aerosols at the site under the influence of fresh sources” is not fully substantiated by the results of this work. First, there is no direct measure of the removal processes here. Second, the mixing state measurement by the SP2 instrument is a nice handle, but does not seem to be more refined (at this point, anyway) than a binary indicator for ‘fresh’ vs ‘aged’ particles (i.e. BC mixing efficiency < 0.4 and > 0.4, respectively, which – by the way - is also observed in the variance in SSA in time). Suggest a minor change in tone: “The BC incorporation/removal process therefore may play a role in modulating the radiative properties of aerosols at the site under the influence of fresh sources.” (This comment is related to the last comment below in this section.) \* Page 25252 lines 22-24, how is the “enhancement of CN from 10:00-20:00” a “clear indication of fresh emissions”? Couldn’t enhanced CN could also be due to photochemical SOA formation? \* Page 25254 Equation 2 (and same page lines 22) and throughout rest of manuscript: For some reason the unit of ‘rBC’, specifically in ‘ug rBC’, is dropped in preference to “ug

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C'. This is incorrect and needs to be changed back to 'ug rBC'. \* Page 25255 line 2 change "10:00 and 12:00" to "10:00 and 20:00", line 21 change "19:00" to "16:00", and page 25256 line 6 change "BC" to "rBC" to agree with results shown in Figure 5. \* Page 25257 lines 5-8, what was the temperature range during the study? \* Page 25257 lines 18-20, the statement, "The presence of brown carbon introduces a bias. . ." is too strong, as the effects of brown carbon are very wavelength dependent and, thus, measurements at longer wavelengths may be unaffected by molecular organic absorption. \* Pages 25258-25259 lines 22-26 and 1-13, discussion here focuses on comparing OOA/HOA and OOA/POA to Zhang et al. 2007 and Allan et al., 2010 results. It should be noted (and is currently not) that the OOA/HOA in Zhang et al. must be compared with OOA/POA (i.e. POA = HOA+SFOA) and not OOA/HOA from this study, as Zhang et al. did not classify HOA into subclasses. Thus, the initial comparison here is incorrect. \* Page 25259 lines 14-21 compares OM/rBC to OC/EC, without noting that while related, these ratios are not the same. \* Last paragraph in Summary should be inverted, so as to down play the implied association (or remove readers confusion on the issue) between the results here and BC removal processes, which were not measured. The paragraph could note the observations of the results of this work (i.e. SSA changes with measured mixing state) and end by hypothesizing that mixing state measurements such as these may provide insights into BC removal processes in the future.

#### Technical comments:

\*. Figures are not clear and would not print. Most of the axes labels are too long, the font sizes too small and/or the resolution is too low to read. See, for example, Figures 2, 3, 4, 5, 6, 7a, and 9. Definitely need to increase font size of numbers on axes and labels and minimize label text (with perhaps explanations in captions). \* Run-on sentence, abstract lines 9-14, "Besides the oxygenated organic aerosol (OOA), this site was found to contain a considerable fraction of primary organic aerosols (POA, mass fraction 50-70% within total mass of OM). The sources of POA are attributed as traffic

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emission and solid fuel burning and are identified as hydrocarbon-like organic aerosol (HOA) and solid fuel organic aerosol (SFOA), respectively.” \* Abstract line 16, “a” single particle soot photometer (rather than “the”). \* Page 25245 line 6 delete ‘the’ in “of the secondary aerosols”. \* Page 25245 line 7 ‘focused’ rather than ‘targeted’ \* Page 25245 line 16 comma before respectively \* Page 25245 line 19 semicolon after OOA before “for example” \* Page 25245 line 24 “. . . particulate mass. Furthermore, BC is highly...” \* Page 25246 line 2 concurrent instead of combined \* Page 25246 line 3 OA rather than OOA \* Page 25248 line 15 semicolon needed, “cloud droplets; thus, when cloud. . .” \* Page 25250 line 7 need period, “. . .USA). The MAAP...” \* Page 25250 line 8 remove comma \* Page 25252 line 11 remove “shown to be” as the time dependence are shown in the plots, not the direct correlations. \* Page 25256 line 18 “. . . relative similarities of the distributions of precursors. . .” \* Page 25257 lines 24 and 26, change “lambda” to “lambda’s” or “lambdas”. \* Page 25259 line 23 remove “significant” before “increase” to agree with results shown in Figure 8 (all variations in Dgm are within the variance of measurement scatter and therefore there cannot be a significant change). \* Page 25260 line 2 example in parentheses should be “low OM/rBC” not “low rBC”? \* Figure 7 Needs “A” and “B” labels in Figure to correlate with caption and change “BBOA” to “SFOA” in Figure.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 25243, 2010.

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